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On the Secular Stagnation puzzle: high profits meet low investment

M.ª Francina Magalhães Marques

Work project carried out under the supervision of:

Francesco Franco

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Abstract

The renewed Secular Stagnation hypothesis, put forward to explain the sluggish growth in the developed economies alongside a low interest rates and low inflation environment, has been largely considered in the literature. These are signs of under-investment relative to saving. However, recently, some economists have begun to note how puzzling these trends are, given that profitability has been high. Therefore, this paper approaches the puzzle that the current low investment in spite of high profits poses, evidencing that a possible reason may lay in the fact that concentration can contribute to hinder investment. Consequently, this has detrimental effects on economic growth and overall welfare, and possibly stagnation. We expose the reasoning behind the hypothesis as well as how it can be linked to the Secular Stagnation debate. Ultimately, our empirical analysis reveals that, in fact, we cannot reject that concentration may harm investment.

Keywords: Secular Stagnation, Under-investment, Innovation, Concentration, Capital allocation, Rents

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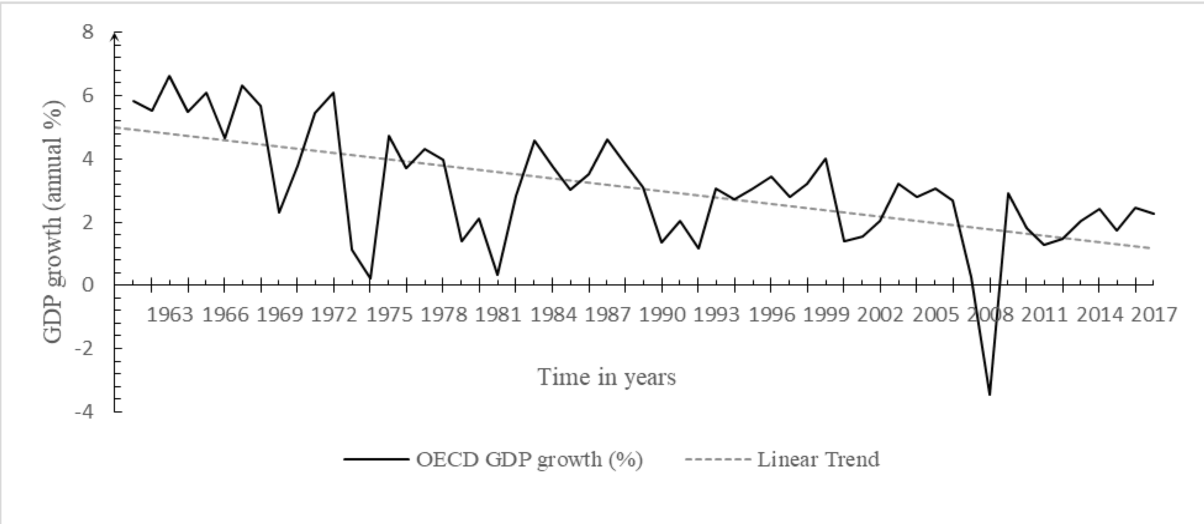
1. Introduction

At present, “records high” profits are frequently proclaimed in stock markets and media as well as surprising innovations (*The Economist*, 2016). However, turning the page of the newspaper, articles written by economists reveal concerns regarding economic growth, lack of investment and unresponsive demand . Some even mention a possible “Secular Stagnation” (Summers, 2014). This appears puzzling. Though, not all companies are facing growing profits. And the number of enterprises with such profitability is also curtailing. The explanation this dissertation finds is in market concentration, which might be a shortcoming from an ever more intangible economy. If this hypothesis is indeed confirmed, it poses a market failure in the allocation of capital that precludes investment, namely in innovation, and consequently, is an obstacle to economic prosperity.

Figure 1 - OECD aggregate GDP growth (annual %)



Annual (%) growth rate of GDP at market prices based on constant 2010 U.S. dollars. GDP is the sum of gross value added produced by all residents plus product taxes and excluding any subsidies not included in the value of the products. Computed with World Bank and OECD’ data.

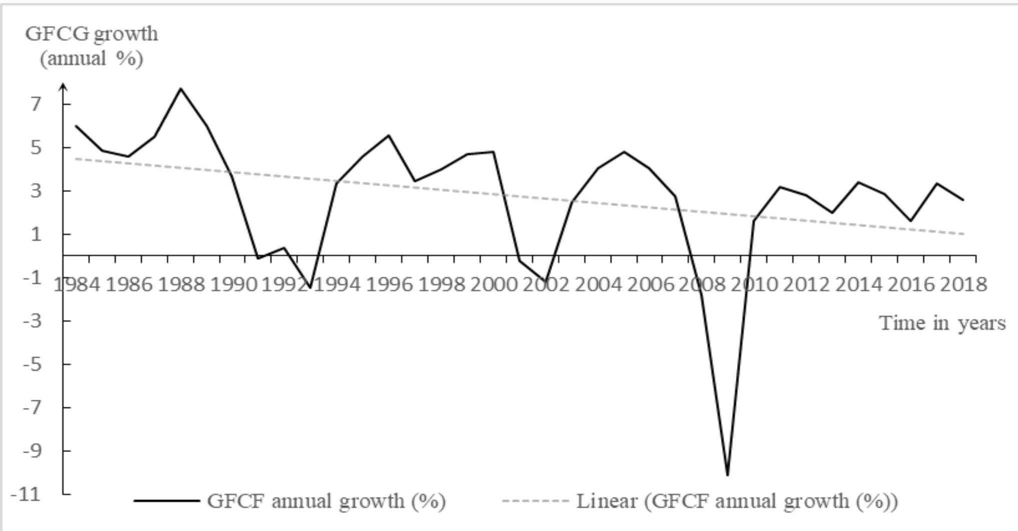
As Figure 1 displays, since the *Golden Age*, the aggregate annual percentage growth rate of GDP in the OECD area has roughly dropped to half. Alongside, the growth in labour productivity, seen as the growth of real GDP per person employed, and the TFP have been slowing (ECB, 2017). Gordon (2012) holds the view that the main impact on productivity of the last great invention – the Internet and the developments in the ICT[1], which began around 1960 - has been withered away in the past years, suggesting that the benefits of ongoing innovation on the standard of living will now on happen at a slower pace than during the past "industrial revolutions" or, similarly, will return to its (low) historical norm. And, as a matter of fact, the first two - between 1750 and 1830 and from 1870 to 1900 - made the economy prosper at least during the 100 years that followed each of them. Even so, does this mean that the new content currently being (and still to be) developed is condemned to lack the usefulness of earlier innovations? One cannot climb to that conclusion so fast. First, the tobin's Q - the ratio between an asset's market value and its replacement cost- in the U.S. increased from 1 in 1970 to 1.75 in 2015 (Eggertsson, Robbins and Wold, 2018), indicating that the market is overvalued. A q>1 means that the value of capital exceeds the cost of acquiring it. Thus, it should be profitable for firms to acquire additional capital. In fact, the share of corporate revenue going to capital rose as well. Second, as pointed, there have been reported "records high" profits (Summers, 2016; *The Economist,* 2016). Under standard assumptions, the rate of profit should reflect the marginal productivity of capital. Thus, the benefit of additional investment in new capital is currently high, especially considering that the risk-free interest rates have never been lower, and that Central Banks show the will of further holding that level to foster a sustainable growth in the economy. Surprisingly, the growth of the real net capital stock has decreased, even before the Great Recession (Magdoff and Foster, 2014; European Commission, 2013). On top of that, some years after the slump, investment remained below pre-crisis forecasts (IMF, 2015). This has been taken as puzzling. However, a growing body of research (Eggertsson, Robbins and Wold, 2018; Summers, 2016; Furman and Orszag, 2018; CEA, 2016) suggests that this trends can indeed be explained by an increase in market power and the consequent emergence of a non-zero-rent economy.

[1] Information and Communication Technology.

A low interest rates and low inflation environment along with sluggish growth seems to be the "new normal" and not just the aftermath of the recession of 2009 (Summers, 2014). For instance, while capital goods prices are exceptionally low, some asset prices - such as the prices of real estate and other risky financial assets - are rapidly and oddly increasing without any strong reason. In part because the near zero returns on safer assets have been pushing investors to turn to riskier assets with higher yields (Teulings and Baldwin, 2014). The shortcoming is the creation of *bubbles* and financial instability.

While this disproportionate demand for safe assets is a sign of excessive saving, the low price of goods suggests that money is not flowing into the real economy as before: investment and consumption are low. Hence, exists an imbalance between investment and saving, which translates in a fall of the natural interest rate of equilibrium perhaps to negative grounds[2]. Figure 2 illustrates the decline in the gross fixed capital formation growth for the high-income economies.

Figure 2 - Aggregate GFCF growth (annual %) of high-income economies[3]



Average annual growth rate of gross fixed capital formation based on constant 2010 U.S. dollars. It includes plant, machinery, and equipment purchases, land improvements and construction. Computed with data from database: World Development Indicators. (accessed in May 20, 2020).

[2] This poses a problem to conventional monetary policy instruments due to the zero-lower bound on interest rate, especially in a unstable financial market.
[3] World Bank and OECD classification.

Piketty (2015) evidenced that household financial wealth in the U.S., measured by the market value of housing and business assets, has increased from 250% of income in 1970 to 400% in 2015. Nevertheless, this financial wealth is not embodied in new productive capital goods. Instead, it has been amassed through capital gains in the housing and stock markets. Hence, where does this wealth come from? And, if not to fixed capital formation, where is it being directed to?

The value added that a company collects from the selling of goods and services has to be first divided between the costs of labour necessary to produce a certain level of output given the capital and technology available, the costs of material inputs and the costs of capital (the annual costs of using all capital inputs in production). The remaining, after taxes being accounted for, constitutes the pure profits of the corporation and can be distributed to the shareholders of the company through dividends or share buybacks, i.e. “downsize and distribute” (Lazonick and O’Sullivan, 2000), can be retained and invested in fixed capital or can also be invested in financial assets - for example, through M&A deals and bond purchase. Similarly, depending on the bargaining power of workers, rents (the excessive returns to market activity that would have occurred anyway in the absence of that excess return) could also have accrued to them in the form of higher labour income (Weil, 2015; Stiglitz, 2015a). Conversely, in most developed economies, not only the increased rents are not being shared with the employees but the labour share (the labour costs as a percentage of value added) has even been decreasing (Elsby, Hobijn and Sahin , 2013; Karabarbounis and Neiman, 2014; Barkai, 2020). This can happen when there is a substitution from labour to capital inputs into production, for instance, assuming a considerable elasticity of substitution between labour and capital, if more capital is used in production, less workers will be needed to achieve the same level of output. On the other hand, the labour share decline can occur as the result of a decrease in its marginal productivity, which leads to a decrease in real wages. Theoretically, the price of a factor should follow its marginal return unless there is a shift in the supply or demand of the given factor. Notwithstanding, the labour productivity has been increasing at a higher pace than the average hourly labour cost and that divergence is even more accentuated when the comparison is made to the median hourly wage (OECD, 2018). Thus, there has been a decoupling of wages and marginal productivity of labour and a rise in inequality. This may presumably be disclosing the influence of monopsony forces in the labour market, which themselves may be a product of market power concentration and decline of competition in the goods market. In fact, this would be an explanation not only for the decline in the labour share but also for the increase in the profit share, the slower fixed capital formation, as well as the diversion of resources from productive investment to rent-seeking financial activities which allow short-term gains (Haskel and Westlake, 2018; Gutiérrez and Philippon, 2016; Furman, 2015). Accordingly, evidence suggests a noticeable decrease in competition (Autor et al., 2017; Grullon, Larkin and Michaely, 2019).

The hypothesis is that, under low competition, there is a decline in business dynamism (OECD, 2017; Decker et al., 2016; Gans, Hsu, and Stern, 2002) which ultimately results in lower innovation. Firstly, because the low pressure allows incumbents – generally larger companies (OECD, 2017) – to invest less in the pursuit of more efficient methods of production (as, for example, labour-saving technologies) (Storm and Naastepad, 2013) and in human capital development, as well as to engage less in the creation of new product prototypes, software and patents. As a matter of fact, having strong bargaining power in the labour market, they may already enjoy cheap unit labour costs, and can effortlessly recruit the more qualified individuals in the labour force without enticing high salaries as some start-ups offer. (Kim, 2017; Barth et al., 2014; Bloom et. al, 2005). In addition, big corporations can easily obtain innovative ideas by “free-riding” on the R&D investment of the growing number of start-ups (or simply SMEs) entering the market (OECD, 2016, 2017), through M&A or by buying their patents and outrights, for example (Haucap and Stiebale, 2019; Gans, Hsu, and Stern, 2002). In this way, large companies are not engaging in the major risks inherent to a first investment but still benefiting from the large capitalization of that assets at low cost. This, along with dividends and share buybacks, is one of the practices through which non-financial firms divert funds from the productive scope of the company to engage in financial activity that promises higher returns in the short-term, compatible with the desire of the institutional owners[4] (Bushee, 1998; Bushee, 2001, Gutiérrez and Philippon, 2016). These conducts may help explain, in part, the high Q-ratios.

Secondly, market concentration can result in lower innovation because it fosters a growing gap between the best performing and laggard firms[5] (European Commission, 2020), which precludes the potential investment of the latter. Large firms typically have higher profitability, while small and young enterprises struggle to stay in the market, even if they are viable and more efficient, because they do not have access to as much funding as the former (Bernanke et al, 1998), which can benefit from an almost unlimited financing both by banks and in the capital markets (European Commission, 2020). Moreover, SMEs lack the capabilities accumulated by incumbents of exploiting "open innovation"[6]- i.e. benefiting from innovative ideas of other firms without the initial costs via spill overs -, of scaling intangible assets over their operations, and the chance of lobbying to contest the claims on their intangible property. Thus, leaders can effortlessly acquire or simply copy good ideas from start-ups or competitors, diminishing their incentives to enter the market or introduce innovations and, in addition, are better at profiting from them, creating synergies with other assets they already

[4] Bushee (1998, 2001) categorizes institutional investors into "dedicated" (DED), "quasi-indexer" (QIX), and "transient" (TRA). TRA, have high portfolio turnover and high diversification consistent with opportunistic strategies. DED and QIX both make long-horizon investments, but QIX institutions hold a diversified portfolio of assets thus they do not care about the return of each specific holding.
[5] Barth et al. 2014 and Song et al. 2015 suggest that much of the rise in earnings inequality is due to the widening dispersion of earnings between firms rather than within firms.
[6] A concept coined by Henry Chesbrough, faculty director of the Centre for Open Innovation of the Haas School of Business.

own as well as network effects (Haskel and Westlake, 2018; Summers, 2016). Indeed, due to its intangible scope, the recent age of technology reinforces this mechanism all the more (Stiglitz, 2015). Consider that some of the most successful corporations of the present required much less capital than the former to achieve their economic size.

In sum, the increase in market power and decline in competition, besides contributing to widen income inequality[7] and divergence across firms, constitute a market failure in the allocation of capital, which weakens investment, especially innovation. Ultimately, this undermines economic growth and prosperity through lack of Schumpeter's "creative destruction" and the multiplier effect. Therefore, it may presumably constitute an explanation for the puzzles that have put Secular Stagnation under intense debate. In fact, this hypothesis has been given more attention and recognition in the literature recently.

The aim of this dissertation is to demonstrate that the conundrum of underinvestment along with high profitability in the business economy is more a hint than a puzzle. To achieve that, I will first display previous contributions in the literature (section 2) - regarding Secular Stagnation, the link between concentration and investment, and concerning the determination of investment behaviour. In section 3, the empirical approach and results will be presented. And, lastly, concluding comments will be exposed (section 4).

[7] Ultimately, an uneven distribution of income can lead to lower consumption, under the assumption that individuals with lower income will have a higher propensity to consume out of their income.

2. Literature Review

2.1. Secular Stagnation

The *Secular Stagnation* hypothesis gained momentum with the Larry Summers' speech at the IMF's 2013 Annual Research Conference (Summers, 2014), when pre-crisis GDP levels had been surpassed, but few economies had yet returned to pre-Crisis growth rates even with the easiness of near-zero interest rates. An imbalance between savings and retracted investment was pushing the natural real interest rate of equilibrium below zero, precluding full employment.

However, the concept had been firstly put forward by Hansen (1939) in the last years of the Great Depression, as a state with "sick recoveries which die in their infancy and depressions which feed on themselves and leave a hard and seemingly immovable core of unemployment". Hansen theorised that before, the growth in the U.S. had only been sustained by innovations and the expansion of land, of resources and population and thus, since at that point in time they were consumed, large investment expenditures would have to occur to sustain growth. However, his idea was disregarded since it was blurred by the growth promoted by the WWII's expenses and the following baby-boom. Nevertheless, Samuelson (1989) developed a Keynes-Hansen-Samuelson multiplier-accelerator model of secular stagnation, and in 1952, Steindl presented a *post-keynesian* approach built on Kalecki's work on economic dynamics (Magdoff and Foster, 2014).

Summers (2014), along with others, suggests that the reasons for the trends may be an increase in life expectancy with no corresponding increase in the retirement age, a population growth' decline, greater risk aversion and increased regulation in the wake of the financial crisis, hysteresis, an acceleration of inequality as well as the changing character of the productive economic activity to industries with low capital intensity. While Summers (2015) presents a more demand-side perspective, Gordon (2015) has a supply-side view. Even before Summer's speech, Gordon (2012) presented "six headwinds" which could explain flattering innovation: demographics, education, energy and environment, private and government debt, inequality and globalization in an ICT era. Later, in the Secular Stagnation debate mentions only four (Gordon, 2014). Only the last two worries of both Summers and Gordon are adjacent to the subject of this paper. On the contrary, Glaeser (2014) rejects the notion that human inventiveness has stalled (as does Mokyr (2014)), instead he questions whether today's inventions offer widespread benefits. Taylor (2014) denies that secular stagnation is coherent with the current facts.

Reviewing the literature around *Secular Stagnation* cannot be accomplished without mentioning the book compiled by *VoxEU*, which gathers the views of Teulings and Baldwin (2014), Krugman (2014), Gordon (2014), Summers (2014), Eichengreen (2014), Caballero (2014), Glaeser (2014) and others. Krugman (2014) states that the "buzz" around Secular stagnation should not be overlooked, stressing a "secular decline in real interest rates", that deleveraging and demographic trends would weaken future demand and particularly that the zero lower bound (ZLB) mattered more than was previously thought. Nick Crafts notes in his chapter that "The depressing effects of slower growth of productive potential will probably be felt more keenly in Europe". Summers (2014) emphasises that "it may be impossible for an economy to achieve full employment, satisfactory growth, and financial stability simultaneously simply through the operation of conventional monetary policy" and evidences the inadequacy of conventional formulations to deal with the issue.

Indeed, both the New Classical and New Keynesian traditions had focused on the volatility around the normal level of output and employment, presuming that, with or without policy intervention, the market will eventually eliminate output gaps and restore full employment. During the "Great Moderation" the DSGE[8] models were sufficient, Summers (2014) argues. Additionally, the ZLB[9] poses difficulties is modelling. Eggertsson and Mehrotra (2014) make the first attempt to model the new Secular Stagnation hypothesis, through an OLG[10] New Keynesian model. The essential features of the model, which allow for a low growth and low interest rate equilibrium, are the downward wage rigidity, the constraint to the young generation's borrowing level and the ZLB included in the Taylor rule. The result is a demand curve that is upward sloping for low inflations and a supply that is vertical at full employment and positively sloped for low inflations, in the AS-AD schedule. The simplification of the model contrasts with the hypothesis of this paper since the producers are price-takers and have a zero-profit.

Krugman (2014) suggested loose monetary policy through unconventional policy instruments, in order to stimulate expectations of higher inflation and low interest rates and Summers (2014) underscores the importance of fiscal policy in these circumstances. Conversely, Starbatty and Stark (2017) explicit the view of the Austrian school that central bank policy is no longer part of the solution but is becoming part of the problem, and that ultra-loose money policy enables banks to keep zombie companies alive leading to a substantial economic burden and a fall in productivity. In this paper I abstain from thoughts regarding monetary policy.

More importantly, Summers's (2016) article "Corporate profits are near record highs. Here's why that's a problem." reveals the possibility of a link between Secular Stagnation and lower competition. Similarly, I intend to clarify the aforementioned relation, explaining the under-investment.

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[8] Dynamic stochastic general equilibrium model.
[9] Zero Lower Bound. The "impossibility" of central banks to set the nominal interest below zero.
[10] Overlapping generations model. The authors considered three generations.

2.2. Linking Concentration and Investment

Consonant with this paper, the downward pattern in business dynamism has been highlighted by Decker et al. (2014), for example. Similarly, both Decker et. al. (2016) and Grullon, Larkin and Michaely (2019) document decreased competition. The latter refers that a "structural shift" has weakened competition. Bronnenberg et al. (2012) evidence concentration at the product market level. And Nekarda and Ramey (2010) analyse potential rises in price-cost mark-ups over time.

Autor et al. (2017) report that the rise of more productive, superstar firms may have contributed to a decrease in competition, adding that these firms display a lower labour share of value added. Decker et al. (2015) argue that the decline in business dynamism was observed across all sectors since 2000, including the usually high-growth information technology sector, and not just in selected sectors (notably retail), as occurred in the 1980s and 1990s.

Alternatively, an increase in the pure profit share - the fraction of pure profits gross value added – is considered indicative of an increase in market power and decline in competition. As a matter of fact, Elsby, Hobijn and Sahin (2013) document a decline in labour share for the U.S., and Karabarbounis and Neiman (2014) evidence a broad, worldwide retreat of labour income. Barkai (2020) has presented intriguing evidence that the pure capital share (usually presumed as responsible for shrinking the share of income going to labour) has decreased, whereas the pure profit share increased. Rognlie (2015) highlights that overall, the net capital share has increased from 1948, but when this rise is disaggregated, the sector contributing to it was essentially the housing sector, and all others have a slightly negative or zero contribution, as the fall and rise may have offset each other. Additionally, Furman and Orszag (2018), albeit more interested in the repercussions on income inequality, argue that there has been a trend of increased dispersion of returns to capital across firms. Indeed, the distribution among publicly traded corporations appears to have grown more skewed to the high end with time. Similarly, Barth et al. (2014) and Song et al. (2015) suggest that much of the rise in income inequality results from the increased dispersion of earnings between firms rather than within firms. Stiglitz (2015) and Piketty (2014) also stress the high and uneven business returns and make their point regarding competition.

Linking the lethargic investment and innovation to the lower of competition and/or business dynamism, two papers were particularly taken into consideration. Primarily Gutiérrez and Philippon (2016), which analyse private fixed investment in the U.S. for 30 years, revealing that investment does not significantly depend on measures of profitability and valuation, particularly Tobin's Q. Therefore, they demonstrate preference for theories that predict low investment *despite* high Q. Using both industry-level and firm-level data, it is tested whether [11]under-investment relative to Q is driven by decreased competition (due to technology, regulation or common ownership), financial frictions, measurement error (due to intangibles or globalization), or stiffened governance and short-termism. They do not find support for theories based on risk premia, financial constraints, or safe asset scarcity, and only weak support for regulatory constraints. Particularly, they emphasize that under-investment may in fact be linked to financialization. Similarly, I consider financialization - the "influence" of financial markets and institutions over the economy and the preference of overall businesses for investments in rent-seeking activities (namely in the FIRE sector), diverting capital from the main activity of the company – as one of the inherent developments from higher concentration. As a matter of fact, an increasing portion of savings and wealth is used to inflate the prices of already existing assets - real estate and stocks - instead of being invested to create new production and innovation. Secondly, Eggertsson, Robbins and Wold (2018) develop a model of a DSGE economy with three modifications which allow them to explain five trends

[11] Finance, Insurance and Real Estate sector.

in the U.S. – (1) an increase in the financial wealth-to-income ratio despite low savings rates, (2) an increase in Tobin's Q, (3) a decrease in the real rate of interest, while the measured average return on capital is relatively constant, (4) an increase in the pure profit share and (5) a fall in investment-to-output, even given (2) and (3). Correspondingly to the present study, they hypothesize that an increase in monopoly is driving these broad macro-trends. However, in their model, concentration is translated through changes in mark-ups. CEA (2016) describes how competition between firms is beneficial for all the economy in general, but also how these benefits can be lost when competition is weakened by firms' actions or government policies.

Further literature suggests that this link is stronger for sectors more technological advanced. Aghion et. al, (2009) provide evidence that the threat of technologically advanced entry spurs innovation incentives - as predicted by Schumpeterian growth theory - in sectors close to the technology frontier, but not in laggard sectors, where the threat reduces incumbents' expected rents from innovating. Haskel and Westlake (2018) make the point that, albeit the business economy is turning from tangible to intangible assets, which are not well measured, that does not constitute the main motive for the stagnation trends. The issue arises from the properties of intangibles: scalability and the possibility of spill-overs.[12] "Leader" companies are "experts" in benefiting from other firms ideas and can take advantage of the scalability feature of intangibles and of the synergies they allow (when combined with other complementary assets they have accumulated), while lagging firms find difficulties in exploiting spill-overs and in capturing the benefits of their investments. They explain that, not only investment decreases due to lower innovation from the lagging firms, but also the leaders have lower incentives to innovate by themselves, especially given the alternative rent-seeking activities at their disposal. Also, leaders may be focussed on managing the complexities of their

[12] Indeed, following Haskel's idea, intangibles nearly assume the properties of public goods of being "non-rivalrous" and "non-excludable."

companies. Their assessment was essential to the shape the hypothesis of the present paper, as well as Furman' (2015) remarks. He stresses the importance of investment for growth and evidences three puzzles: the impact of technology on investment, rising returns to capital, and potential mismeasurement. Additionally, Brynjolfsson and McAfee (2014) underscore the dichotomy of the "bounty of technology"[13] and the growing differences in material success among households (the "spread"). Interestingly, they point to the lower social mobility and to globalization as obstacles to higher incomes and growth. Globalization may be another reason for stagnation in developed economies due to the replacement of domestic investment and workers by offshoring (Autor, Dorn and Hanson, 2013). However, Brynjolfsson and McAfee (2014) have the view that automation may have had more impact. In the empirical section of this work, through the addition of foreign direct investment outflows in the main equation, I evaluate the influence of globalization on investment.

2.3. Investment Determination

Contemporary theories of aggregate investment behaviour in the literature and subsequent empirical studies developed from the accelerator model, the neo-classical model first proposed by Jorgensen (1963), the Tobin's Q model (Tobin, 1969; Tobin and Brainard, 1968) and the option theory. The accelerator model describes investment as a function of the desired stock of capital, which is determined by output growth (the "acceleration"). But because the model overlooks the influence of uncertainty, profits, market imperfections, financial aspects and other variables, it has been reformulated over time into the flexible accelerator model of investment (Goodwin, 1948). The neo-classical specification is another an alternative to the rigid accelerator models, augmented to include the effects of relative

[13] The increase in volume, variety and quality of products alongside a decrease in the cost of products and services.

prices, namely the user cost of capital[14] alongside the lagged level of output. Conversely, under Tobin's model, the level of investment is determined by the average q-ratio (the market value of the firm relative to the replacement cost of its capital). I will not follow the q-ratio model since it has been proved empirically irrelevant (Gutiérrez and Philippon, 2016).

Moreover, in this investigation, I decided to discard the contributions presenting the real economy (and thus investment) as dependent upon the monetary policy environment (Bernanke and Blinder, 1988; Mishkin, 1996), given the short period of analysis of this empirical work (from 1998 to 2017) and given the lack of effectiveness of the credit channel that has been felt, mainly due to the liquidity trap (Keynes, 1936; Krugman et. al, 1998), but also due to the response to the uncertainty of the commercial banks themselves - not actually translating the more loosened monetary policy into higher credit to their borrowers (Gambacorta and Marques-Ibanez, 2011).

[14] The cost of capital is computed from the purchase cost of the additional capital, the rates of interest and depreciation and the levels of relevant taxes.

3. Empirical Specification

In order to examine whether a higher concentration may be propitious to lower innovation in the business sector, I will resort to a country level analysis on the market economy' concentration and investment in the non-financial business (aggregated). The following specification (1) is proposed:

$$Infg_{it} = \alpha + \beta_1 \Delta HHI_{it} + \beta_2 lnK_{it} + \beta_3 BCI_{it} + \beta_4 fdi_{out_{it}} + \varepsilon_{it} \quad ,$$

where $i = 1,2, \ldots 22$ identifies each country and $t = 1,2, \ldots 19$ corresponds to the year of each observation. α is a constant term (individual and time-invariant) and β_c, with $c = 1,2,3,4$, stands for the coefficients relative to each of the independent variables. ε_{it} is the error term for each observation. The explanatory variables, following their order in equation (1), are: the change in the Herfindahl-Hirschman Index (multiplied by 100), the logarithm of fixed capital' stock, OECD's Business Confidence Index (BCI) and lastly, the net foreign direct investment outflows as a percentage of GDP, for each country i in year t. The dependent variable, $Infg_{it}$, is the gross fixed capital formation as a proportion of the gross operating surplus of the non-financial market economy for each country i in year t. The computation consists in the following (2)[15]:

$$Infg_{it}\ (\%) = \frac{GFCF_{it}}{Gross\ Value\ Added_{i,t-1} - Labour\ Compensation_{i,t-1}} * 100$$

The main specification (1) is in line with the flexible accelerator models, in which output determines the desired capital. The flexibility arises from including the influence of a market imperfection such as concentration (through HHI) and the possibility of offshoring, reflected in FDI. Furthermore, future output depends on its previous values but lately also on uncertainty and rational expectations. Therefore, the model considers a business confidence

[15]The denominator ($Gross\ Value\ Added_{it} - Labour\ Compensation_{it}$) is an approximation for the aggregated Gross Operating Surplus of the market economy.

indicator (BCI_{it}) as regressor, as well as the gross operating surplus proxy (in $t-1$) as denominator of the dependent variable. In fact, the growth of GOS_{t-1} nearly mimics output growth - given that labour compensation has been almost stagnant during the 20 years of our analysis (and abstracting from government transfers).

The choice of the ratio between GFCF and the gross operating surplus as outcome variable is due to its potential for comparison between different economies but also because it enables to place the value of investment in perspective with the capability (of each economy) to generate it. Moreover, it is supposed that both the numerator and denominator move similarly through business cycles, which might neutralize the influence of slumps or better-than-average years.

3.1. Data

The required data was retrieved from several sources, presented in table 1. It comprises 22 OECD countries from 1998 to 2017. The sample consists of all the economies covered by the EU KLEMS database, excluding six of them, which revealed missing data for one or more variables in the time period considered. A list with the economies is in the appendix.

Table 1 - Sources of the required variables

Variables	Sources	Aggregation	Units
$GFCF_{it}$ $Gross\ Value\ Added_{it}$ $Labour\ Compensation_{it}$ K_{it}	EU KLEMS Database (2019)	Market Economy minus Financial activities' values for each country	NAC mn: Current Prices Current Prices Current Prices Volume 2010 ref. prices
ΔHHI_{it}	WITS – Country Profile (2020)	Market indicator of each country	p.p.
BCI_{it}	OECD (2020)	Country	NA
$fdi_{out_{it}}$	World Development Indicators (2020)	Country's Business economy	(% GDP)

In the EU KLEMS database, "Market economy" corresponds to all industries excluding real estate, public administration, defence, education, human health, social work activities as well as those having households as employers[16]. That definition is adopted in this paper. Data restricted to the non-financial market economy was not available. Thus, to retrieve the values for the market economy excluding financial activities, the values for the market economy were subtracted by the values relative to the financial and insurance industry[17]. The variables $Infg_{it}$ and lnK_{it} concern all fixed assets and the variable $fdi_{out_{it}}$ is the sum of net investment in equity capital, reinvestment of earnings, and other capital from the reporting economy to the rest of the world, as a proportion of GDP. The criterion for considering the existence of a direct investment relationship is the ownership of at least 10 percent of the ordinary shares of voting stock. The BCI provides information on future developments, based upon opinion surveys in the industry sector. Numbers above 100 (=long term average) suggest confidence in near future business performance, and numbers below 100 indicate pessimism towards future performance.

The descriptive statistics of the variables are presented in the appendix. It is expected that lnK_{it} has a positive impact on $Infg_{it}$ since, for example, economies with an higher stock of capital are likely to suffer from higher capital depreciation, which is part of GFCF. Likewise, BCI_{it} should have a positive influence because it represents higher confidence in the business sector. On the other hand, in the case of a constant share of FDI inflows (% GDP), the larger the foreign direct investment outflows as a percentage of GDP, the lesser would probably be the funds directed to investment in domestic assets. Though, a simultaneous (and proportional) increase in FDI inflows could offset the impact of the rise in outflows. Lastly, if ΔHHI_{it}> 0 - and the higher that value is - the concentration is supposed to be increasing and thus, following

[16] The industries excluded were L, O, P, Q, T and U - in accordance with the industry classification (NACE Rev. 2/ISIC Rev. 4) and the European System of National Accounts (ESA 2010).
[17] Industry classification of the Financial and insurance activities is K.

the hypothesis this paper aims to test, the investment share of gross operating surplus is expected to decrease.

3.2. Results

After conducting the Wooldridge test and the Pesaran's test, the evidence was pointing to the presence of autocorrelation as well as cross sectional independence. In these circumstances, despite the coefficient estimates from common panel estimators— such as fixed effects (FE), random-effects (RE), or pooled ordinary least-squares (OLS) estimators—are still consistent (even though inefficient), the standard error estimates are biased. Therefore, because statistical inference based on such standard errors would be invalid, the estimation of equation (1) was led with Driscoll-Kraay standard errors. These heteroskedasticity- and autocorrelation-consistent and robust standard errors are produced in a nonparametric covariance matrix proposed by Driscoll and Kraay (1998).

However, this procedure has the shortcoming of leading to inviable Hausman test results (Hoechle, 2007). Therefore, both Fixed Effects and Random Effects estimations were conducted. Conversely, the OLS estimation was proved inappropriate against the former two, through the F-test of whether all country-effects equal zero and through the Breusch-Pagan Lagrange multiplier test, respectively. In addition, unit-root tests revealed stationarity of all variables included in this model. The variable HHI in levels, non-stationary, was replaced with its first difference. The outcomes of these examinations are presented in the appendix. The results of the estimations through Fixed Effects and Random Effects estimators are exhibited in table 2.

In line with the hypothesis put forward in this paper and others (Gutiérrez and Philippon, 2016; Eggertsson et. al, 2018), both estimations demonstrate a negative coefficient (of -1,57 p.p. with RE and -1,15 p.p. with FE) for the change in the concentration index, suggesting that higher concentration may contribute to lower the share of gross operating surplus directed to GFCF, under a significance level of 10%, along with other factors. Indeed, higher capital stock may also lead to lower the investment share of GOS_{t-1}, since the coefficient of the logarithm of the stock of capital is also negative and significant even at a significance level of 5% (similarly to Jorgenson (1963)). On the other hand, the results reveal a positive impact on $Infg_{it}$ from both business confidence (BCI_{it}) - as expected - and $fdi_{out_{it}}$. However, while BCI is significant at the 1% level of significance, it cannot be rejected that the impact of $fdi_{out_{it}}$ might be null. The reason for the insignificance of net FDI outflows (% GDP) on influencing investment is likely to be the fact that its increases arise along with increases of investment inflows, which would contribute to increase the dependent variable (as You and Solomon (2015) found for China). Thus, the resulting increase in GFCF by non-residents would offset the investment channelled to offshoring instead of domestic activities.

Table 2 - Panel estimation results

Independent variables	**Dependent variable: $Infg_{it}$ (%)**			
	FE	RE	FE	RE
ΔHHI_{it}	-1.146* (0.647)	-1.567* (0.757)	-1.022* (0.529)	-1.386* (0.697)
lnK_{it}	-13.710*** (1.541)	-5.527** (2.328)	-15.453*** (0.133)	-7.688*** (1.405)
BCI_{it}	0.277*** (0.074)	0.307*** (0.060)	0.273*** (0.066)	0.301*** (0.053)
$fdi_{out_{it}}$	0.027 (0.025)	0.027 (0.031)		
Year FE	No	No	No	No
F-statistic	31.12	29.44	96.30	53.29
p-value	0.00	0.00	0.00	0.00
R^2	0.161	0.037	0.220	0.029
N° Obs.	351	351	407	407

Table shows the results of the country panel regressions of Infg (%) over the period 1998-2017. Annual data. Driscoll-Kraay standard errors in brackets. * p<0.10, ** p<0.05, *** p<.01

Given the above, the estimation was repeated excluding the variable $fdi_{out_{it}}$. The results are given in table 3 and the estimation output is in the appendix. As a matter of fact, they demonstrate a better fit than the first two estimations. In addition, under this specification, the variable ΔHHI_{it} shows more significance comparing both fixed-effects estimations– revealing a rise in the p-value from 0.056 to 0.062-, but less significant comparing the two random effects estimations - the p-value decreases from 0,097 to 0.069. However, it is still relevant at the 10% significance level.

Finally, two additional estimations (omitting $fdi_{out_{it}}$) were conducted to consider the effects of time that are invariant between cross-section units. These could be relevant given the fact that our period of analysis includes the 2009 recession. The first used time dummies (time-effects). In this case, although the coefficients for the variation in HHI were still negative in both RE and FE regressions, the results were less favourable towards the confirmation of the hypothesis of negative influence from concentration on the investment variable. The p-value associated with the coefficient in each estimation was of 0.252 and 0.407, respectively. Thus, based on this result, we would not be able to reject that the ΔHHI might have a null impact. The estimation output is displayed in the appendix. The second specification included a time-trend, which was significant only in the random effects' regression, at the 1% level. However, in both RE and FE regressions, the results reveal a negative coefficient for the change in the concentration index, in accordance with the main specification results. In addition, all variables besides the time trend demonstrate relevance at the 1% significance level.

Nevertheless, these results should be examined prudently because they were estimated based on a small sample of economies and, moreover, some variables that could be relevant were not included due to unavailability of data. Even though, other regressors - venture capital growth rate (%), the cumulative share of the population with tertiary education (%), the share of income accruing to the top 10% highest paid (%) as well as the domestic credit to private sector by banks (% of GDP) - were tested and revealed to be non-significant at a 10% level, when included separately to the specification (1) using the RE model.

4. **Conclusion**

Since Larry Summers' 2013 speech, in which the potential issue of Secular Stagnation was re-introduced, there has been wide interest in investigating this hypothesis further. The existing literature has extensively exposed the limitations that the *zero lower bound* poses to monetary policy, hindering its effectiveness in boosting demand in the economy. This applies to both FED, ECB and BoJ policies. Moreover, the demographic trends as well as the difficulties in coping with private and government debt have also been put forward as possible causes. A more unsettling theory was the one suggesting a return to a low historical growth, "normal" in a state with no largely impactful invention as the steam engine or electricity (Gordon, 2014). The latter assumes that the innovation aptitude might be currently weak. Alternatively, it has also been argued whether the shift to a more intangible capital era is contributing to sluggish income and investment growth, due to its poor measurement but also its inherent properties (Haskel and Westlake, 2018).

Nevertheless, it is essential to dig more profoundly to understand how Secular Stagnation can be transversal to economies that, despite sharing the classification of "developed", display many distinct features. Hence, this paper exposes a hypothesis that lately has been put forward under a few perspectives - for example, Summers (2016) – but has not yet been given much attention. Namely, the possibility that concentration, alongside the consequent financialization, reduced business dynamism and lower social mobility, may be one of the main contributors to the decline in innovation and, subsequently, investment. As a result, under-investment precludes prosperity, growth and has a negative influence on interest rates, given that saving is in excess. Ultimately, the aim of this study is to expose the theory that concentration may harm investment, as well as to clarify the connection between that hypothesis and Secular Stagnation, suggesting that it may be the missing piece of the so remarked "puzzle" (Furman, 2015; Lazonick, 2014). Alongside, an empirical analysis enabled to test whether concentration has been having a negative impact on investment. And, as a matter of fact, the findings of the empirical investigation followed here support that hypothesis, with at least 10% significance. The fact that significance was found estimating with both FE and RE may be indicative of a considerable part of the impact of concentration on investment coming from changes of concentration within each cross-section unit (with time). However, these results should be taken cautiously because, due to lack of data available, the sample is limited, as well as the variables that could be included. Information regarding Tobin-q, the proportion of financial assets on total assets, the share of institutional ownership, as well as the interest rate spread between large enterprises and SME's, the share of total revenue accruing to the top x companies of the distribution and other measures of concentration would be pertinent in this analysis, but were not available for a considerable sample and therefore a simpler model was chosen. Nonetheless, other variables such as venture capital growth rate (%), the cumulative share of the population with tertiary education (%), the share of income accruing to the top 10% highest paid (%) and the domestic credit to private sector by banks (% of GDP) were tested and revealed to be non-significant at a 10% level, when added to the specification (1), which uses Driscoll-Kraay standard errors.

Given the above, the findings of this study could support the point that the issue is not that there is stagnation in the creation of wealth – as stressed by Eggertsson et. al (2018) - but instead, that wealth itself may possibly not have been effectively allocated to production and development, but towards less prosperous ends, not benefiting the overall welfare. The structure of developed economies (as well as the endogenous evolution of technology) is possibly behind that failure.

However, institutions are a key force shaping how an economy functions and cannot be ignored (Acemoglu and Robinson, 2015). While most regulation is directed to foster competition and business dynamism, another can have the opposite effect. Indeed, a larger share of the rise in profits and valuation has been due to factors associated with increasing regulation and political activity (Bessen, 2016) - this may be through bailouts, creation of entry barriers, government contracts, etcetera. Presumably, this increase happens in part because technologies are getting more complicated and, accordingly, the grant of patents and property rights has become of extreme necessity - otherwise there is no benefit to innovate. Nevertheless, a quest for an adequate balance of regulation is mandatory as well as a more expeditious adjustment of authorities to the accelerating market and technology transformations.

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Appendix

Figure 3– Descriptive Statistics of variables

Variable		Mean	Std. Dev.	Min	Max	Observations
c_id	overall	12.40909	6.499757	1	23	N = 440
	between		6.645149	1	23	n = 22
	within		0	12.40909	12.40909	T = 20
year	overall	2007.5	5.772845	1998	2017	N = 440
	between		0	2007.5	2007.5	n = 22
	within		5.772845	1998	2017	T = 20
HHI	overall	.0745245	.0267987	.0356852	.1669023	N = 440
	between		.0240441	.0403714	.1127131	n = 22
	within		.0128481	.0443255	.136581	T = 20
BCI	overall	100.0857	4.222874	52.97623	132.7048	N = 440
	between		.3946238	99.71273	101.6419	n = 22
	within		4.205196	51.42008	131.1486	T = 20
fdi out	overall	5.622711	12.4024	-58.32288	75.96384	N = 352
	between		7.920222	.5612905	32.26379	n = 22
	within		9.683513	-77.36008	56.92664	T = 16
gos_p	overall	8392362	3.57e+07	1018.989	1.90e+08	N = 440
	between		3.65e+07	3403.27	1.72e+08	n = 22
	within		2021338	-9070588	2.68e+07	T = 20
lK	overall	13.52121	2.259084	8.48727	19.12848	N = 424
	between		2.30742	9.662988	18.86539	n = 22
	within		.2616209	12.34549	14.18698	T-bar = 19.2727
Inf	overall	3883616	1.63e+07	932.1	9.06e+07	N = 440
	between		1.66e+07	2388.22	7.83e+07	n = 22
	within		1430719	-8474864	1.62e+07	T = 20
infg	overall	59.04853	19.34535	14.82267	181.2668	N = 440
	between		16.52981	38.29109	117.0307	n = 22
	within		10.62232	22.98303	123.2847	T = 20
dhhi	overall	-.1374564	.5491599	-3.027469	2.520914	N = 418
	between		.1025025	-.4049977	.0072244	n = 22
	within		.5399291	-2.846117	2.788456	T = 19

Note:

1. ***gos_p*** is the Gross Operating Surplus proxy (in the previous year) computed with euation (2).
2. ***Inf*** is the Investment (GFCF) in non-financial activities for the market economy.
3. ***dhhi*** corresponds to ΔHHI_{it}
4. All the other variables are as presented in the text.

Figure 3 -- List of the 22 economies under analysis

Cross-section: Countries		
Austria	Finland	Lithuania
Belgium	France	Luxembourg
Denmark	Hungary	Portugal
Deutschland	Italy	Sweden
Estonia	Japan	Slovenia
Greece	Netherlands	Slovak Republic
Spain	Poland	United Kingdom
		United States

Figure 4 – Estimation of equation (1) with Driscoll-Kraay Standard Errors – Random Effects

```
. xtscc infg dhhi BCI lK fdi, re
(89 missing values generated)

Regression with Driscoll-Kraay standard errors   Number of obs     =       351
Method: Random-effects GLS regression            Number of groups  =        22
Group variable (i): c_id                         Wald chi2(4)      =     29.24
maximum lag: 2                                   Prob > chi2       =    0.0000
corr(u_i, Xb) = 0 (assumed)                      overall R-squared =    0.0369

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.566514   .7568964    -2.07   0.056    -3.179801    .0467724
         BCI |   .3072996   .0596821     5.15   0.000     .1800902     .434509
          lK |  -5.526691   2.327694    -2.37   0.031    -10.48805   -.5653285
     fdi_out |   .0268116   .0315603     0.85   0.409    -.0404575    .0940807
       _cons |   100.5653   34.05387     2.95   0.010     27.98123    173.1494
-------------+----------------------------------------------------------------
     sigma_u |  15.108393
     sigma_e |  7.6259782
         rho |  .79695647   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Figure 5 - Estimation of equation (1) with Driscoll-Kraay Standard Errors –Fixed Effects

```
. xtscc infg dhhi BCI lK fdi, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =       351
Method: Fixed-effects regression                 Number of groups  =        22
Group variable (i): c_id                         F(  4,     15)    =     31.12
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.1606

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.146179   .6467023    -1.77   0.097    -2.524592    .2322342
         BCI |   .2770002   .0740038     3.74   0.002     .1192648    .4347355
          lK |  -13.71052   1.540797    -8.90   0.000    -16.99466   -10.42639
     fdi_out |   .0267219   .0248601     1.07   0.299    -.0262661    .0797099
       _cons |   214.3198   24.07907     8.90   0.000     162.9965    265.6432
------------------------------------------------------------------------------
```

Figure 6 – Estimation with Driscoll-Kraay Standard Errors –Random Effects (FDI omitted)

```
. xtscc infg dhhi BCI lK, re
(33 missing values generated)

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Random-effects GLS regression            Number of groups  =        22
Group variable (i): c_id                         Wald chi2(3)      =     53.29
maximum lag: 2                                   Prob > chi2       =    0.0000
corr(u_i, Xb) = 0 (assumed)                      overall R-squared =    0.0293

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.385889   .6965608    -1.99   0.062    -2.849309    .0775307
         BCI |   .3007504   .0528218     5.69   0.000      .189776    .4117248
          lK |  -7.688333   1.405381    -5.47   0.000    -10.64093   -4.735737
       _cons |   131.4601   24.03757     5.47   0.000     80.95908    181.9612
-------------+----------------------------------------------------------------
     sigma_u |  15.375623
     sigma_e |  7.9693498
         rho |  .78824198   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Figure 7 - Estimation with Driscoll-Kraay Standard Errors –Fixed Effects (FDI omitted)

```
. xtscc infg dhhi BCI lK, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Fixed-effects regression                 Number of groups  =        22
Group variable (i): c_id                         F(  3,     18)    =     96.30
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.2195

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.022227   .5286239    -1.93   0.069    -2.132825    .0883706
         BCI |   .2733435   .0658268     4.15   0.001     .1350464    .4116406
          lK |  -15.45332   1.132908   -13.64   0.000    -17.83347   -13.07316
       _cons |   239.2781   18.79216    12.73   0.000     199.7972    278.7589
------------------------------------------------------------------------------
```

Figure 8 - Breusch and Pagan Lagrangian multiplier test for random effects

```
 xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        infg[c_id,t] = Xb + u[c_id] + e[c_id,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    infg |   268.6451       16.3904
                       e |   58.15554       7.625978
                       u |   228.2636       15.10839

        Test:   Var(u) = 0
                             chibar2(01) =  1416.24
                          Prob > chibar2 =   0.0000
```

Figure 9 – Pesaran's test for cross-sectional independence

```
xtcsd, pesaran abs

*FE:
Pesaran's test of cross sectional independence =     3.247, Pr = 0.0012

Average absolute value of the off-diagonal elements =     0.291


*RE:
Pesaran's test of cross sectional independence =     2.361, Pr = 0.0182

Average absolute value of the off-diagonal elements =     0.285


. xtserial infg dhhi BCI lK fdi

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,       21) =     38.433
           Prob > F =      0.0000
```

Figure 10 – Unit-root test for HHI in levels (with no lags, drift or trend)

```
. xtunitroot fisher HHI, dfuller lags(0)

Fisher-type unit-root test for HHI
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     20

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 0 lags
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(44)    P        30.1189       0.9451
 Inverse normal             Z         1.5093       0.9344
 Inverse logit t(114)       L*        1.4075       0.9190
 Modified inv. chi-squared Pm        -1.4797       0.9305
------------------------------------------------------------------------------
```

Figure 11 – Unit-root test for HHI with 1 lag

```
. xtunitroot fisher HHI, dfuller lags(1)

Fisher-type unit-root test for HHI
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     20

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(44)    P       116.2269       0.0000
 Inverse normal             Z        -2.3927       0.0084
 Inverse logit t(114)       L*       -4.2145       0.0000
 Modified inv. chi-squared Pm         7.6994       0.0000
------------------------------------------------------------------------------
```

Figure 12 – Unit-root test for HHI in level with trend

```
. xtunitroot fisher HHI, dfuller trend lags(0)

Fisher-type unit-root test for HHI
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     20

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Included
Drift term:   Not included                  ADF regressions: 0 lags
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(44)   P        45.5332       0.4081
 Inverse normal            Z         1.2001       0.8849
 Inverse logit t(114)      L*        0.8581       0.8037
 Modified inv. chi-squared Pm        0.1634       0.4351
------------------------------------------------------------------------------
```

Figure 13 – Unit-root test for HHI in levels with drift

```
. xtunitroot fisher HHI, dfuller drift lags(0)

Fisher-type unit-root test for HHI
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     20

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Included                      ADF regressions: 0 lags
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(44)   P       102.8769       0.0000
 Inverse normal            Z        -5.6448       0.0000
 Inverse logit t(114)      L*       -5.5978       0.0000
 Modified inv. chi-squared Pm        6.2763       0.0000
------------------------------------------------------------------------------
```

Figure 14 – Unit-root test for the difference in HHI

```
. xtunitroot fisher dHHI, dfuller lags(0)
(22 missing values generated)

Fisher-type unit-root test for dHHI
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     19

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 0 lags
------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------
 Inverse chi-squared(44)   P       394.2304       0.0000
 Inverse normal            Z       -15.9158       0.0000
 Inverse logit t(114)      L*      -23.2571       0.0000
 Modified inv. chi-squared Pm       37.3347       0.0000
------------------------------------------------------------------------
```

Figure 15 – Unit-root test for Infg (Dependent variable)

```
. xtunitroot fisher infg, dfuller lags(0)

Fisher-type unit-root test for infg
Based on augmented Dickey-Fuller tests
--------------------------------------
Ho: All panels contain unit roots           Number of panels  =     22
Ha: At least one panel is stationary        Number of periods =     20

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 0 lags
------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------
 Inverse chi-squared(44)   P        97.6628       0.0000
 Inverse normal            Z        -3.1500       0.0008
 Inverse logit t(114)      L*       -3.4785       0.0004
 Modified inv. chi-squared Pm        5.7205       0.0000
------------------------------------------------------------------------
```

Figure 16 - Estimation with time-effects (FE)

```
. xtscc infg dhhi BCI lK i.year, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Fixed-effects regression                 Number of groups  =        22
Group variable (i): c_id                         F( 21,     18)    =   8878.65
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.2941

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |   -.505235   .5953173    -0.85   0.407     -1.75595    .7454802
         BCI |   .0241172   .1268613     0.19   0.851    -.2424086    .2906429
          lK |  -13.97121    3.30955    -4.22   0.001    -20.92432   -7.018102
             |
        year |
       1998  |          0  (empty)
       1999  |   9.034307   1.856192     4.87   0.000     5.134591    12.93402
       2000  |   10.91987   1.870753     5.84   0.000     6.989565    14.85018
       2001  |    11.0762   1.700849     6.51   0.000     7.502844    14.64955
       2002  |   3.855243   1.458001     2.64   0.016     .7920979    6.918389
       2003  |    7.07132   1.203909     5.87   0.000        4.542     9.60064
       2004  |   6.917102   1.452962     4.76   0.000     3.864542    9.969663
       2005  |   6.244475   1.184732     5.27   0.000     3.755447    8.733504
       2006  |   9.017212   1.255832     7.18   0.000     6.378806    11.65562
       2007  |   11.53557   1.201769     9.60   0.000     9.010746    14.06039
       2008  |    9.21006    .764956    12.04   0.000     7.602947    10.81717
       2009  |          0  (omitted)
       2010  |   6.705697   .6655947    10.07   0.000     5.307335     8.10406
       2011  |   8.090034   .7488949    10.80   0.000     6.516664    9.663404
       2012  |   5.366379   .6385084     8.40   0.000     4.024922    6.707835
       2013  |   7.365695   .6991317    10.54   0.000     5.896874    8.834516
       2014  |   7.699479   .8312641     9.26   0.000     5.953058      9.4459
       2015  |   7.798535   .8178557     9.54   0.000     6.080284    9.516786
       2016  |   7.004055   .9064224     7.73   0.000     5.099733    8.908378
       2017  |   9.209338   1.140366     8.08   0.000     6.813519    11.60516
             |
       _cons |   236.7716   47.79371     4.95   0.000     136.3607    337.1824
------------------------------------------------------------------------------
```

Figure 17 - Estimation with time-effects (RE)

```
. xtscc infg dhhi BCI lK i.year, re
(33 missing values generated)

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Random-effects GLS regression            Number of groups  =        22
Group variable (i): c_id                         Wald chi2(21)     =  1.21e+08
maximum lag: 2                                   Prob > chi2       =    0.0000
corr(u_i, Xb) = 0 (assumed)                      overall R-squared =    0.0618

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -.5812559    .690861    -0.84   0.411    -2.032701    .8701892
         BCI |   .0246097   .1069664     0.23   0.821    -.2001183    .2493377
          lK |  -3.584968   2.669427    -1.34   0.196    -9.193227     2.02329
             |
        year |
       1998  |          0  (empty)
       1999  |   109.4261   29.85961     3.66   0.002     46.69339    172.1588
       2000  |   110.7409   29.72338     3.73   0.002     48.29444    173.1874
       2001  |   110.8901   29.08385     3.81   0.001     49.78719     171.993
       2002  |   103.0598   29.30077     3.52   0.002     41.50115    164.6184
       2003  |   105.8339   29.53354     3.58   0.002     43.78622    167.8815
       2004  |   105.1761   29.35587     3.58   0.002     43.50173    166.8505
       2005  |   104.0302   29.59429     3.52   0.002     41.85494    166.2055
       2006  |   106.2285   29.64163     3.58   0.002     43.95374    168.5032
       2007  |   108.0393   29.79929     3.63   0.002     45.43335    170.6453
       2008  |   104.9735   30.11583     3.49   0.003     41.70254    168.2446
       2009  |   95.16756   30.61995     3.11   0.006     30.83744    159.4977
       2010  |   101.7754   30.36294     3.35   0.004     37.98521    165.5655
       2011  |   103.0015   30.42617     3.39   0.003     39.07844    166.9245
       2012  |   99.96764   30.47552     3.28   0.004     35.94096    163.9943
       2013  |   101.7726   30.58343     3.33   0.004     37.51921     166.026
       2014  |   101.8824   30.57302     3.33   0.004     37.65082    166.1139
       2015  |   101.8344   30.62869     3.32   0.004      37.4859    166.1829
       2016  |    100.858   30.62428     3.29   0.004     36.51874    165.1972
       2017  |   102.5817   30.61971     3.35   0.004     38.25204    166.9113
             |
       _cons |          0  (omitted)
-------------+----------------------------------------------------------------
     sigma_u |  15.069818
     sigma_e |  7.7644447
         rho |  .79022431   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Figure 18 - Estimation with time trend (RE)

```
. xtscc infg dhhi BCI lK c.year, re
(33 missing values generated)

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Random-effects GLS regression            Number of groups  =        22
Group variable (i): c_id                         Wald chi2(4)      =     79.94
maximum lag: 2                                   Prob > chi2       =    0.0000
corr(u_i, Xb) = 0 (assumed)                      overall R-squared =    0.0452

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.118752   .6115818    -1.83   0.084    -2.403637    .1661338
         BCI |   .2992646   .0373072     8.02   0.000      .220885    .3776442
          lK |  -3.775019   2.235888    -1.69   0.109    -8.472446    .9224084
        year |  -.4575209   .1341148    -3.41   0.003    -.7392856   -.1757561
       _cons |    997.656   252.0661     3.96   0.001     468.0848    1527.227
-------------+----------------------------------------------------------------
     sigma_u |  14.611847
     sigma_e |  7.9797953
         rho |   .7702706   (fraction of variance due to u_i)
------------------------------------------------------------------------------
```

Figure 19- Estimation with time trend (FE)

```
. xtscc infg dhhi BCI lK c.year, fe

Regression with Driscoll-Kraay standard errors   Number of obs     =       407
Method: Fixed-effects regression                 Number of groups  =        22
Group variable (i): c_id                         F(  4,     18)    =    139.19
maximum lag: 2                                   Prob > F          =    0.0000
                                                 within R-squared  =    0.2195

------------------------------------------------------------------------------
             |             Drisc/Kraay
        infg |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        dhhi |  -1.021724   .5369328    -1.90   0.073    -2.149778    .1063298
         BCI |   .2734516   .0686707     3.98   0.001     .1291798    .4177235
          lK |  -15.39269   3.377749    -4.56   0.000    -22.48908   -8.296304
        year |  -.0033427   .1988336    -0.02   0.987    -.4210766    .4143912
       _cons |   245.1605   353.4347     0.69   0.497    -497.3784    987.6993
------------------------------------------------------------------------------
```